MATH 54 – HINTS TO HOMEWORK 3

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Here are a couple of hints to Homework 3. Enjoy!

Section 1.5: Solution sets of linear systems

1.5.14. The line that goes through $\begin{bmatrix} 0 \\ 3 \\ 2 \\ 0 \end{bmatrix}$ and with 'slope' $\begin{bmatrix} 5 \\ -2 \\ 5 \\ 1 \end{bmatrix}$

1.5.24.

(a) **F** ($\mathbf{x} = \mathbf{0}$ is always a solution)
(b) **F** (I leave it up to you to come up with such an equation)
(c) **T**
(d) **T** (Because then $\mathbf{b} = A\mathbf{0} = \mathbf{0}$)

1.5.29. Nontrivial means $\mathbf{x} \neq \mathbf{0}$. The best way to do this is to draw a picture of what the reduced-echelon form of the matrix looks like! Also, for (b), if one of the rows of A is a row of zeros, then the equation $A\mathbf{x} = \mathbf{b}$ has no solution (for some $\mathbf{b}$).

Section 1.7: Linear independence

1.7.1, 1.7.5. Row-reduce (after putting everything in a matrix, if necessary). If you get n pivots, then the set is linearly independent. Else, it's linearly dependent.

1.7.11. Row-reduce!

1.7.17. A set with the zero-vector is always linearly dependent.

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1.7.21.

(a) **F** (the equation $A\mathbf{x} = \mathbf{0}$ **always** has the trivial solution, no matter what the columns of A look like!)

(b) **F** (for example, $S = \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} \right\}$ doesn't satisfy this! The correct statement should be: there is **some** vector such that $\cdots$)

(c) **T** (in other words, 5 vectors in $\mathbb{R}^4$ are linearly dependent)

(d) **T** (otherwise the set would be linearly independent)

1.7.23. This matrix can only have one or no pivots (in the last case, the matrix is the zero-matrix). This is because if the matrix has 2 pivots, the columns would be linearly independent.

1.7.33. Remember that a set is linearly dependent if there's a relationship between the vectors in the set. Also, a set with the zero vector is always linearly dependent.

1.7.36. **FALSE** (give me explicit examples of vectors such that $\mathbf{v_1} = \mathbf{v_2}$ and $\mathbf{v_3}$ linearly independent from $\mathbf{v_1}$ and $\mathbf{v_2}$! The point is for linear independence, you have to consider the set as a whole!)